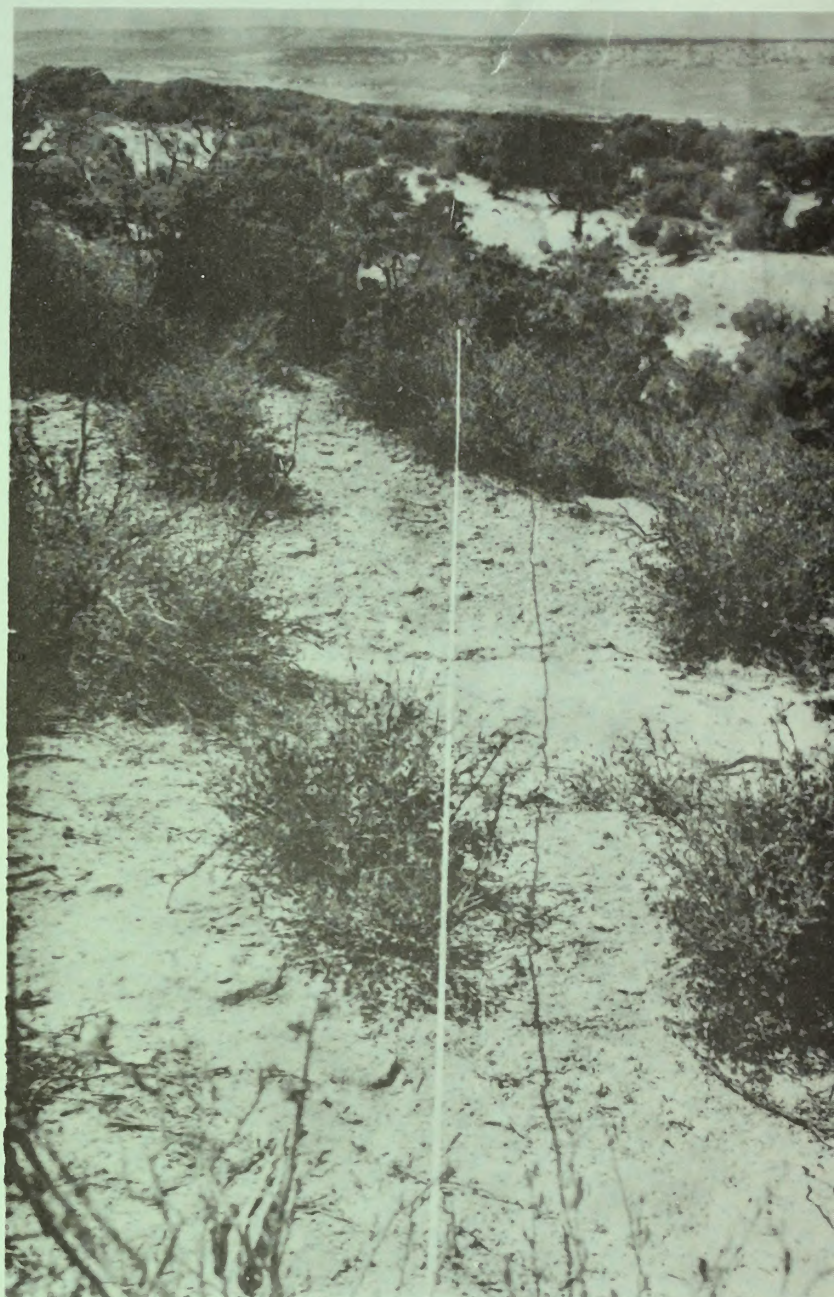
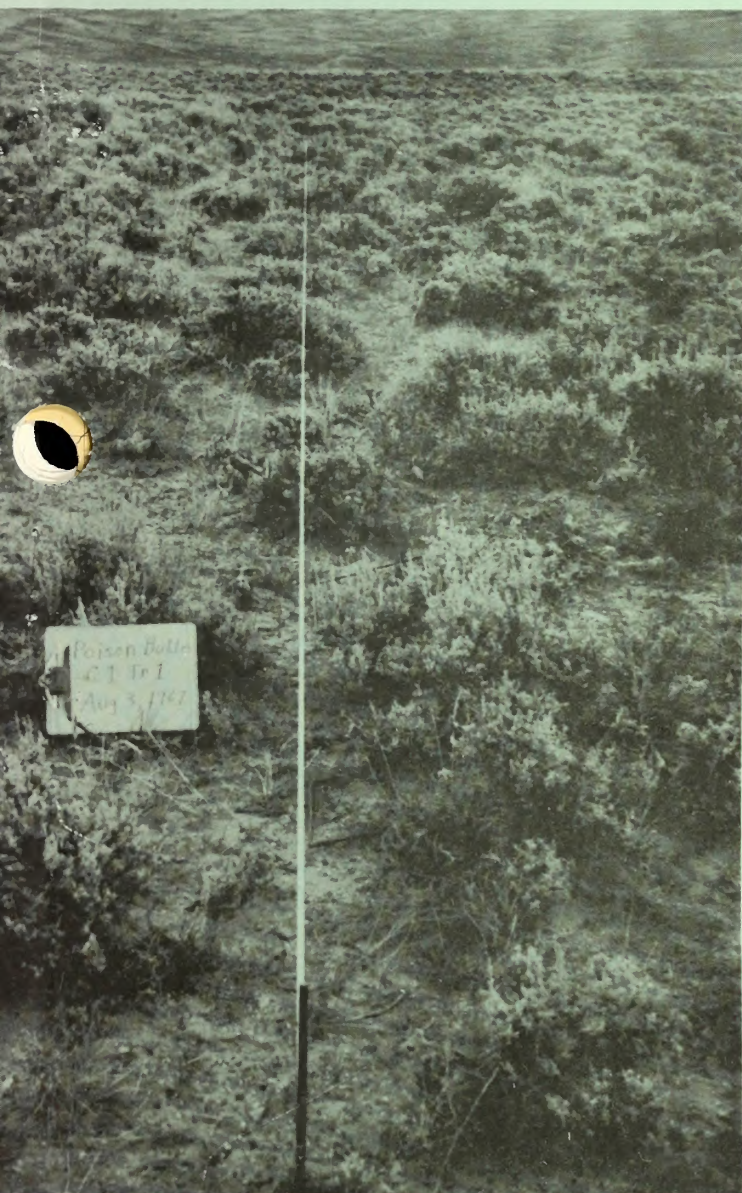


University of Wyoming

Cooperative Research Report
to the Bureau of Land Management



ANNUAL PROGRESS REPORT
1967

GRAZING SYSTEMS RESEARCH

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Influence of Grazing Management Systems
on Vegetation and Wildlife Habitat

by

R. P. Gibbens, H. G. Fisser, and M. May¹

Annual Report

of

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July, 1967 - July, 1968

Cover Photographs

The two major vegetation types found on the study site near Baggs, Wyoming are portrayed. On the left is a stand of big sagebrush - western wheatgrass which is the most important forage producing type for livestock. On the right is a view of the Utah juniper - shrub type which constitutes the major deer habitat.

Published with approval of the Director, Wyoming Agricultural Experiment Station, as Scientific Report No. 102.

¹Agriculture Research Assistant, Associate Professor, and Professor of Range Management, Range Management Section, University of Wyoming, Laramie, respectively.

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

July 27, 1967
(Date)

ATIN: 705

FROM: *ED (9/10 a)*
DM, Rawlins

SUBJECT: Transmittal of map - Coop. Research West of Bagg, Wyo.

ACTION REQUESTED:

RECEIVED
BUREAU OF LAND MANAGEMENT
COMMUNICATIONS UNIT

DATE COMPLETED:

AM

AM
7, 8, 9, 10, 11, 12, 1, 2, 3, 4, 5, 6

REMARKS:

Enclosed is a copy of map showing the research study area as requested by Dave Wilson, your office.

Jens Jensen
Acting

Note: Return this form when action is completed or attach it to data requested

INTRODUCTION

by

116
216

INTRODUCTION

Competition and pressure for use of rangelands in the semi-arid desert portions of Wyoming by interests such as livestock, wildlife, recreation and mining has created a situation requiring maximum efficiency in management of these lands. Grazing management systems have been inaugurated throughout the western United States but these have seldom been tested on desert shrub types common to the arid intermountain region. This study was initiated in 1967 as the start of a 10-year project to evaluate three systems of grazing management on high altitude, semi-desert shrub ranges in southern Wyoming. Objectives of the study are as follows: (1) to evaluate livestock grazing systems in terms of effects upon vegetation cover and composition; (2) to evaluate influence of livestock grazing systems on wildlife habitat; (3) to evaluate Bureau of Land Management approved methods for determination of utilization and trend.

LOCATION AND DESCRIPTION OF STUDY AREA

The 68,362 acre study area is located along the Wyoming-Colorado border just west of Baggs, Wyoming. Land ownership in the tract is as follows: federal, 64,989 acres (95.1%); private, 2,773 acres (4%); state, 600 acres (0.9%). The area is divided into seven pastures; a one-pasture unit with season long grazing, a two-pasture unit with rotation grazing and a four-pasture unit with rest, rotation grazing (Fig. 1).

The topography is rough and broken as the area lies along the breaks of the Little Snake River. Elevation ranges from about 6,200 to 7,000 feet. Steep hillsides and breaks are typically covered with Utah juniper (*Juniperus osteosperma*), while big sagebrush (*Artemisia tridentata*) and western wheatgrass (*Agropyron smithii*) predominate on less precipitous and level areas. Bluebunch wheatgrass (*Agropyron spicatum*), threadleaf sedge (*Carex filifolia*), Nuttall saltbush (*Atriplex nuttallii*), shadscale (*A. confertifolia*), birdfoot sagewort (*Artemisia pedatifida*) and black greasewood (*Sarcobatus vermiculatus*) are dominants of communities represented on relatively small areas in several of the pastures.

A sagebrush control program has been carried out in some of the pastures. Acreages and year of treatments are as follows: Poison Buttes, 700 acres in 1962 and 722 acres in 1967; Oppenhiemer East, 1,465 acres in 1967; Oppenhiemer West, 534 acres in 1967; Pasture C, 451 acres in 1966; and Pasture A, 1,583 acres in 1966.

METHODS AND PROCEDURES

Transects of 20 quadrats, 1 ft. x 1 ft., spaced systematically along a 100 ft. tape, were established and marked to provide permanent sampling sites for the measurement of change in vegetative cover and composition. Percent cover of herbaceous plants and shrubs was estimated within each sq. ft. plot. Photo station pictures were taken at each transect site.

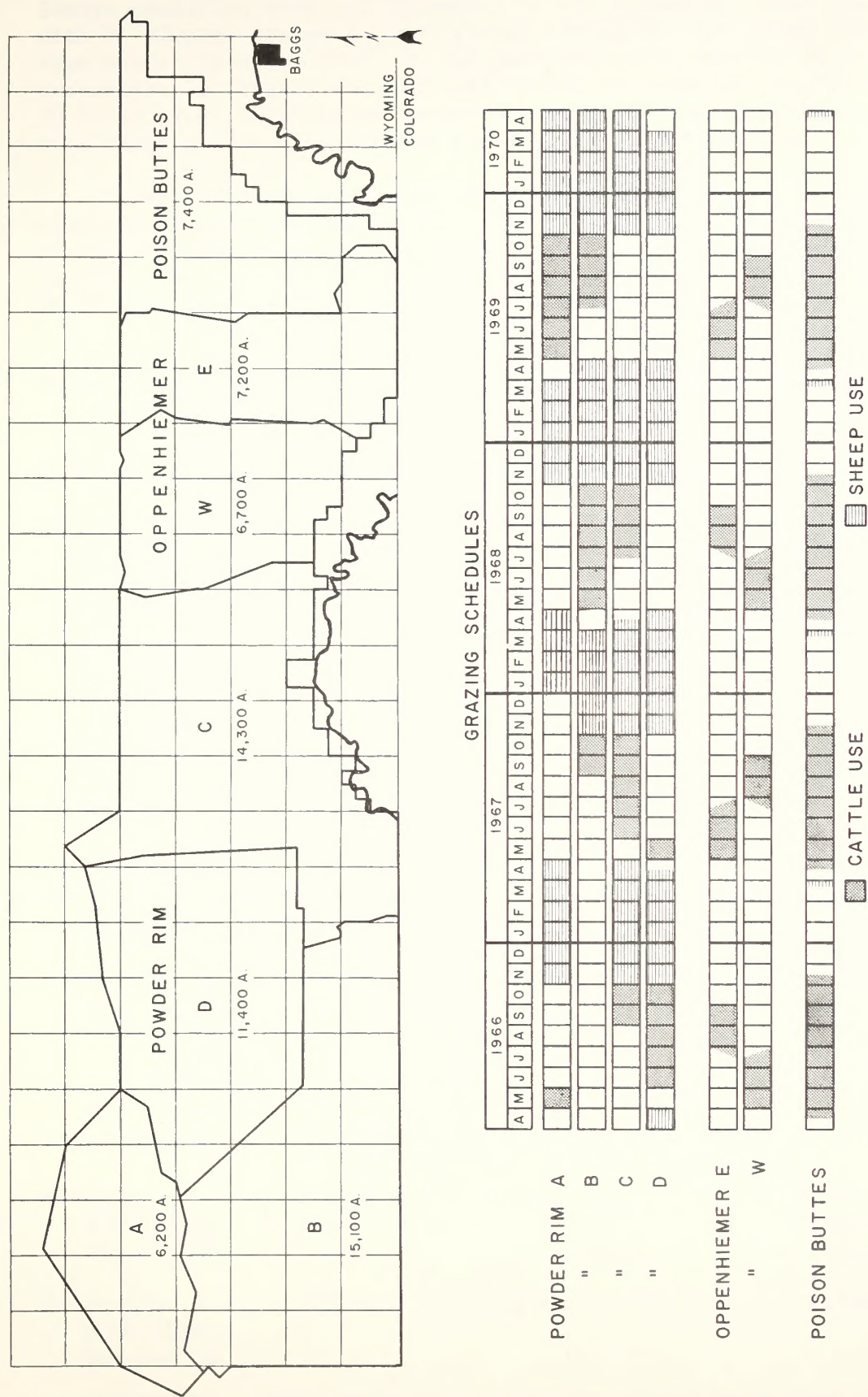


Figure 1. Map of the Baggs study area showing grazing units and approximate acreages. Grazing schedules for each unit are shown in the diagram below. The grazing schedule for the rest-rotation system in the Powder Rim allotment has been adjusted to permit a more equitable distribution of forage among the operators. This change becomes effective on May 1, 1968 and grazing will follow the indicated pattern.

Unsprayed, big sagebrush - western wheatgrass is the major livestock forage producing type and is common to all pastures. This type was sampled with 38 cluster transects distributed throughout the seven pastures. Other vegetation types, not found in all pastures, were sampled with a total of 25 transects. A cluster transect was placed in close proximity to each of the 20 trend plots established by the Bureau of Land Management in 1967. This will allow a direct comparison of methods and conclusions.

Permanent exclosures were constructed during the fall of 1967. Particulars of each exclosure are given in Table I. A total of 20 transects was established inside and outside of the livestock exclosures to provide data for use, no-use comparisons. The two game exclosures were not completed in time to permit sampling in the 1967 season.

Table I. Location, size and vegetation types enclosed by permanent exclosures.

Location	Size	Type of Exclusion	Vegetation Enclosed
Poison Buttes R92W T13N SE $\frac{1}{4}$ Sec 25	204' x 204' (1 acre)	Livestock	Sprayed sagebrush- grass
Poison Buttes R92W T13N SE $\frac{1}{4}$ Sec 36	200' x 300'	$\frac{1}{2}$ livestock $\frac{1}{2}$ game and live- stock	Juniper-mountain mahogany
Openhiemer East & West R92W T13N SW $\frac{1}{4}$ Sec 5	204' x 204'	Livestock	Sprayed and non- sprayed sagebrush- grass
Powder Rim Pasture A R94W T13N SW $\frac{1}{4}$ Sec 25	204' x 204'	Livestock	Sprayed sagebrush- grass
Pasture B R95W T13N SW $\frac{1}{4}$ Sec 36	204' x 204'	Livestock	Saltbush and sage- brush
Pasture B R95W T13N NW $\frac{1}{4}$ Sec 10	204' x 204'	Game and live- stock	Juniper
Pasture C R93W T13N SW $\frac{1}{4}$ Sec 28	204' x 204'	Livestock	Sprayed and non- sprayed sagebrush- grass
Pasture D R94W T13N SW $\frac{1}{4}$ Sec 26	204' x 204'	Livestock	Shadscale

On September 1, 1967, a rain gauge was placed at each of the eight exclosures and at nine other sites. The 17 rain gauges will provide information on the rainfall distribution over the study area. Precipitation measurements will be made on the following dates: April 15, July 1, September 1, and October 15.

The juniper type, which is the principal deer habitat, was sampled in each pasture by means of combination line-point and belt transects. A total of 6,075 ft. of these transects were established at selected locations to obtain a measure of density and cover of woody species and ground cover. Canopy cover and cover at the ground surface were recorded at 1 ft. intervals along a 100 ft. tape.

Shrubs and trees were counted in a 10 ft. strip, 5 ft. on either side of the tape. Young (1 to 3 years old) and mature classes of plants were recorded separately. Transect locations were permanently marked so that they may be resampled at 3-year intervals to follow reproduction and mortality of browse species.

Utilization of key forage and browse species by the cattle and sheep grazing the area is being determined at the end of each grazing period (see Figure 1 for grazing periods). Western wheatgrass has been designated as the key grass species in all pastures. Utilization is determined by counting the number of grazed and ungrazed stems of western wheatgrass in sq. ft. samples taken along paced transects at each cluster sampling site. Utilization of mountain mahogany and bitterbrush will be determined from reduction in length of tagged and measured leaders supplemented by estimates of use. Utilization of other shrubs will be determined by estimates only. Additional information on game use will be obtained from pellet counts made on 1/100-acre plots cleared of pellets at each marker stake along the line-point transects.

Arrangements have been made with Soil Conservation Service personnel to obtain a soil type association map. Also, they will provide detailed descriptions of soils at exclosures and other sites representative of general soil types.

1967 DATA SUMMARY

To facilitate the investigation, plant specimens were collected for identification and preparation of permanent mounts. Tentative identification indicates that 156 species were collected. A checklist will be prepared following verification of identifications.

Data from the 20-plot transects represent the largest group of data collected. However, analysis of these data awaits completion of a computer program.

Data from the belt and point transects have been summarized. Shrub and juniper density at each sampling site, expressed as number of plants per

On September 14, 1951, the Board of Directors of the
University of California at Berkeley, California, met in
session to consider the report of the Committee on the
University of California at Berkeley, California, which
was submitted to the Board of Directors on September 14, 1951.

The Committee on the University of California at Berkeley,
California, was organized by the Board of Directors on September 14, 1951,
and its report was submitted to the Board of Directors on September 14, 1951.
The Committee was organized to study the University of California at Berkeley,
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RECOMMENDATIONS

The Committee on the University of California at Berkeley,
California, recommends that the Board of Directors of the University of California at Berkeley,
California, should take the following actions:

1. That the Board of Directors of the University of California at Berkeley,
California, should take the following actions:

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California, should take the following actions:

acre, is shown in Table II. Since the sampling areas were deliberately established on sites where browse species occurred, the data should not be construed as being representative of the juniper type as a whole. The data do furnish a basis for measurement of future change and indicate, to some degree, the variation found within the various pastures.

Mountain mahogany is one of the most abundant browse plants and the degree of hedging indicates very heavy past use. Young plants of this species are not abundant and were found to occur principally on north-facing slopes. Bitterbrush is less abundant than mountain mahogany and is more erratic in occurrence. Young bitterbrush plants are usually conspicuous in their absence. Big sagebrush, black sage (*Artemesia nova*) and shadscale were very abundant on some of the sampled sites. Future measurements will provide information on the reproduction and mortality trends of these browse species.

Table II. Number of Utah juniper trees and shrubs per acre as determined from belt transects 10 ft. wide.

Pasture and sample size	Class of plants	Utah juniper	Mountain Mohogany	Bitter-brush	Black sage	Big sagebrush	Shad-scale
Poison Butes 10,000 sq. ft.	Young ^{1/}	9	26	0	0	0	0
	Mature	187	728	183	1023	379	0
	Total	196	754	183	1023	379	0
Oppenhiemer East 9,850 sq. ft.	Young	9	243	159	0	18	0
	Mature	102	363	106	2306	389	0
	Total	111	606	265	2306	407	0
Oppenhiemer West 9,900 sq. ft.	Young	4	176	0	0	0	0
	Mature	207	515	53	1848	189	0
	Total	211	691	53	1848	189	0
Pasture C 10,000 sq. ft.	Young	4	836	0	0	17	366
	Mature	92	1002	0	0	562	453
	Total	96	1838	0	0	579	819
Pasture D 4,000 sq. ft.	Young	54	11	11	860	229	0
	Mature	196	316	414	1133	686	98
	Total	250	327	425	1993	915	98
Pasture B 10,000 sq. ft.	Young	44	244	0	0	118	523
	Mature	169	462	0	0	1242	357
	Total	213	706	0	0	1360	880
Pasture A 7,000 sq. ft.	Young	50	0	0	0	6	0
	Mature	143	0	520	1612	517	0
	Total	193	0	520	1612	523	0

^{1/} Young plants are those from about 1 to 3 years old.

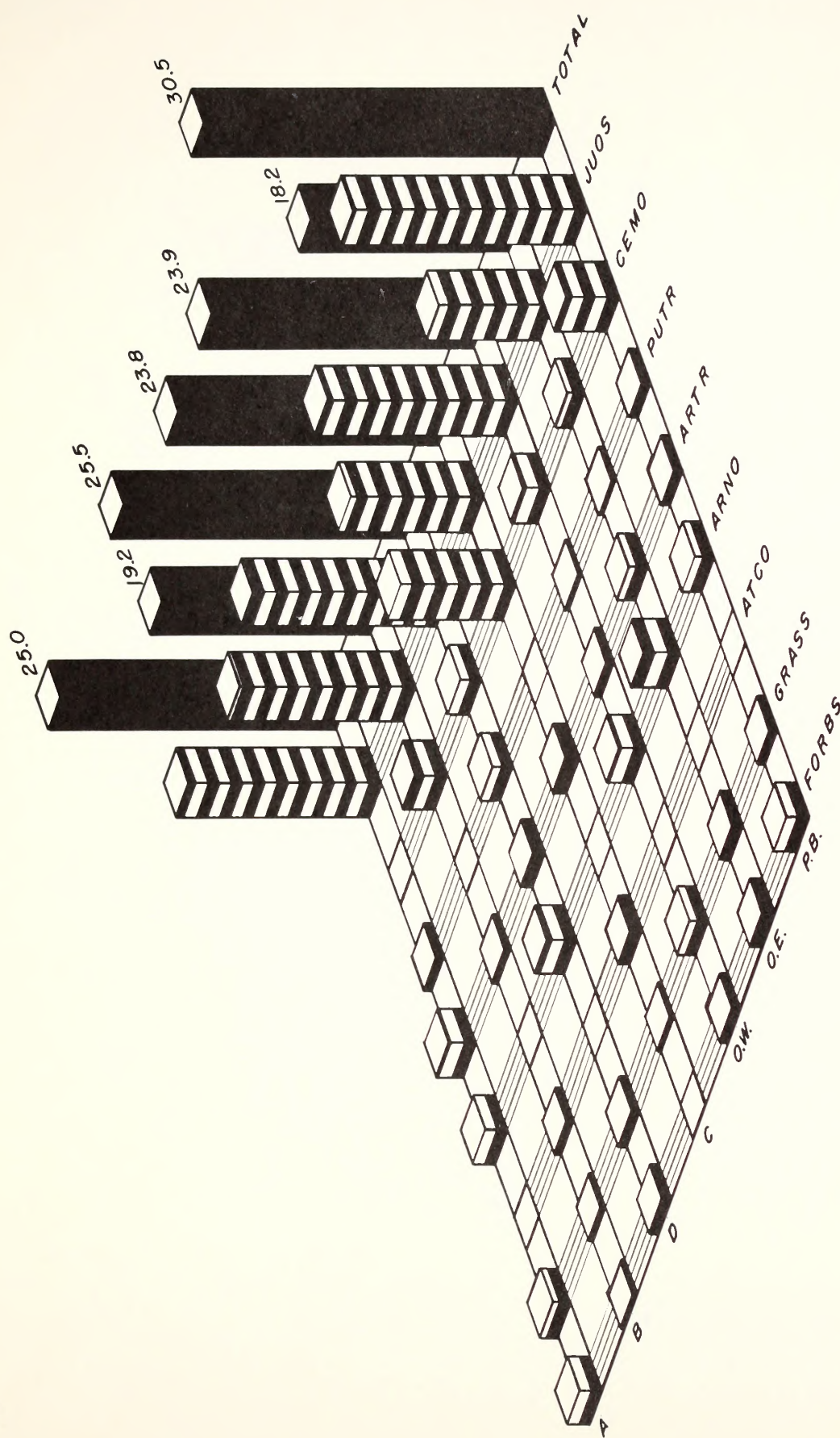


Figure 2. Canopy cover in the Utah juniper-shrub types as determined from line-point plots taken at one foot intervals along transects in each pasture. Height of the vertical columns above the base plane represents cover in percent. The alternating black and white "blocks" each represent 1 percent cover. Values for total cover are given at the top of last row of columns. Symbols on the left-hand side of the base plane represent the four pastures in the Powder Rim allotment (A,B,C,D), and the Oppenhiemer West (O.W.), Oppenhiemer East (O.E.) and Poison Buttes (P.B.) allotments. Code letters on right-hand side of base plane represent species as follows: JUOS, Utah juniper; CEMO, mountain mahogany; PUTA, bitterbrush; ARNO, big sagebrush; ATCO, black sagebrush; shadscale.



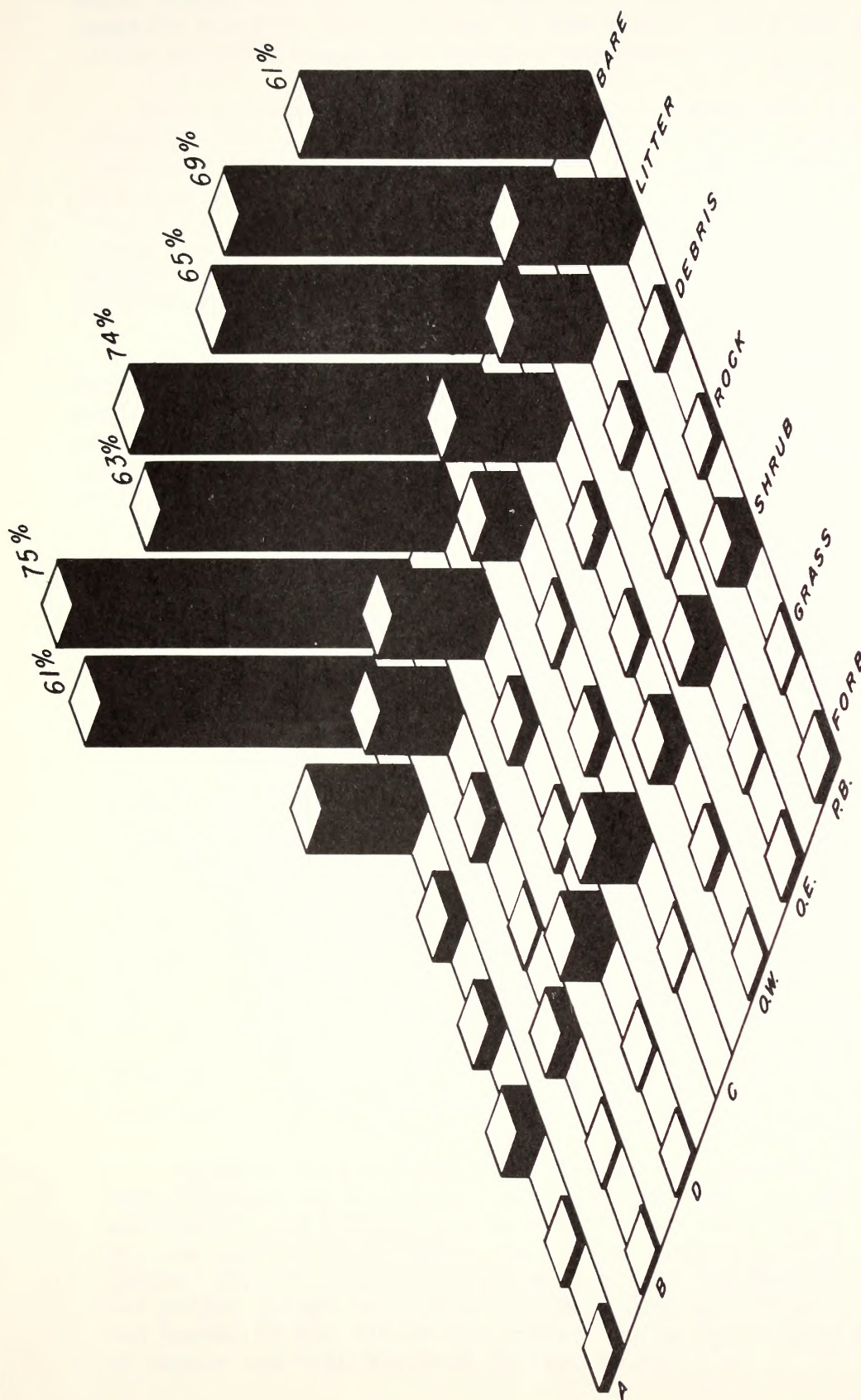


Figure 3. Type of cover at the ground surface in the Utah juniper-shrub type as determined from line-point plots taken at one foot intervals along transects in each pasture. Percent cover of the various categories of ground cover is represented by height of columns above the base plane. Percent of bare ground is shown and all categories for each pasture add to 100 percent. Pasture symbols are the same as in Figure 2.

The line point samples, taken at 1 ft. intervals along the transects, provide a measure of total canopy cover by species (Fig. 2). Total canopy cover ranged from 18.2 to 30.5 percent on the areas sampled. Juniper and mountain mahogany provided most of the cover. Forbs and grasses contributed little cover in comparison to woody vegetation.

When recording the line points several categories of ground cover were recorded. For example, litter, rock, debris (woody material over $\frac{1}{4}$ inch in diameter), shrub, grass and forb categories were recorded if, at the point location, such material protected the soil surface from erosive action. All other area was recorded as bare, irregardless of whether or not an overhead canopy was present. The areas occupied by these ground cover classes are shown in Figure 3. In each sampled area over 61 percent of the ground surface was devoid of protective cover.

The utilization of western wheatgrass in each grazed unit for the 1967 cattle grazing season is shown in Table III. In most of the pastures the range in utilization is large, indicating a very uneven distribution of grazing. Average height of grazed plants ranged from 1 to 5 inches and the height-weight ratio determined from a composite sample indicated that utilization by weight ranged from 84 to 17 percent for grazed plants.

Table III. Percentage of grazed western wheatgrass stems as determined from counts made in sq. ft. samples taken along paced transects.

Sampling Site	Poison Buttes	Oppenhiemer East	Oppenhiemer West	Pasture C	Pasture D	Pasture B
C-1	2	77	57	52	18	0
C-2	13	39	89	44	27	5
C-3	11	55	44	20	32	2
C-4	20	39	20	5		52
C-5	26	13	47	25	37	0
C-6	22	56	42	53	36	9
C-7	90	35	35			54
C-8	98					1
C-9	89					43
C-10	12				35	0
Exc I	91	15	49	82		78
Average	58	41	49	45	32	17

Antelope were consistently observed in Pastures A, B, C and D. None were observed in the Oppenhiemer allotment and only five in the Poison Buttes allotment. The maximum number of antelope observed on the study area in any one day was 32. Summer use by deer appeared to be confined to the juniper type in Poison Buttes, Oppenhiemer and Pastures C, D and B. Tracks and pellet groups indicated that deer concentrations were greatest along the breaks of the Little Snake River in Pastures C and B. No deer or signs of summer use were observed in Pasture A.

The first point to be noted is that the results of the analysis of the data are in general in good agreement with the results of the analysis of the data of the other experiments. This is particularly true in the case of the results of the analysis of the data of the other experiments.

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Table 1. Results of the analysis of the data of the other experiments.

Experiment	Results	Results	Results	Results	Results
1	1.0	1.0	1.0	1.0	1.0
2	1.0	1.0	1.0	1.0	1.0
3	1.0	1.0	1.0	1.0	1.0
4	1.0	1.0	1.0	1.0	1.0
5	1.0	1.0	1.0	1.0	1.0
6	1.0	1.0	1.0	1.0	1.0
7	1.0	1.0	1.0	1.0	1.0
8	1.0	1.0	1.0	1.0	1.0
9	1.0	1.0	1.0	1.0	1.0
10	1.0	1.0	1.0	1.0	1.0
11	1.0	1.0	1.0	1.0	1.0
12	1.0	1.0	1.0	1.0	1.0
13	1.0	1.0	1.0	1.0	1.0
14	1.0	1.0	1.0	1.0	1.0
15	1.0	1.0	1.0	1.0	1.0
16	1.0	1.0	1.0	1.0	1.0
17	1.0	1.0	1.0	1.0	1.0
18	1.0	1.0	1.0	1.0	1.0
19	1.0	1.0	1.0	1.0	1.0
20	1.0	1.0	1.0	1.0	1.0
21	1.0	1.0	1.0	1.0	1.0
22	1.0	1.0	1.0	1.0	1.0
23	1.0	1.0	1.0	1.0	1.0
24	1.0	1.0	1.0	1.0	1.0
25	1.0	1.0	1.0	1.0	1.0
26	1.0	1.0	1.0	1.0	1.0
27	1.0	1.0	1.0	1.0	1.0
28	1.0	1.0	1.0	1.0	1.0
29	1.0	1.0	1.0	1.0	1.0
30	1.0	1.0	1.0	1.0	1.0
31	1.0	1.0	1.0	1.0	1.0
32	1.0	1.0	1.0	1.0	1.0
33	1.0	1.0	1.0	1.0	1.0
34	1.0	1.0	1.0	1.0	1.0
35	1.0	1.0	1.0	1.0	1.0
36	1.0	1.0	1.0	1.0	1.0
37	1.0	1.0	1.0	1.0	1.0
38	1.0	1.0	1.0	1.0	1.0
39	1.0	1.0	1.0	1.0	1.0
40	1.0	1.0	1.0	1.0	1.0
41	1.0	1.0	1.0	1.0	1.0
42	1.0	1.0	1.0	1.0	1.0
43	1.0	1.0	1.0	1.0	1.0
44	1.0	1.0	1.0	1.0	1.0
45	1.0	1.0	1.0	1.0	1.0
46	1.0	1.0	1.0	1.0	1.0
47	1.0	1.0	1.0	1.0	1.0
48	1.0	1.0	1.0	1.0	1.0
49	1.0	1.0	1.0	1.0	1.0
50	1.0	1.0	1.0	1.0	1.0
51	1.0	1.0	1.0	1.0	1.0
52	1.0	1.0	1.0	1.0	1.0
53	1.0	1.0	1.0	1.0	1.0
54	1.0	1.0	1.0	1.0	1.0
55	1.0	1.0	1.0	1.0	1.0
56	1.0	1.0	1.0	1.0	1.0
57	1.0	1.0	1.0	1.0	1.0
58	1.0	1.0	1.0	1.0	1.0
59	1.0	1.0	1.0	1.0	1.0
60	1.0	1.0	1.0	1.0	1.0
61	1.0	1.0	1.0	1.0	1.0
62	1.0	1.0	1.0	1.0	1.0
63	1.0	1.0	1.0	1.0	1.0
64	1.0	1.0	1.0	1.0	1.0
65	1.0	1.0	1.0	1.0	1.0
66	1.0	1.0	1.0	1.0	1.0
67	1.0	1.0	1.0	1.0	1.0
68	1.0	1.0	1.0	1.0	1.0
69	1.0	1.0	1.0	1.0	1.0
70	1.0	1.0	1.0	1.0	1.0
71	1.0	1.0	1.0	1.0	1.0
72	1.0	1.0	1.0	1.0	1.0
73	1.0	1.0	1.0	1.0	1.0
74	1.0	1.0	1.0	1.0	1.0
75	1.0	1.0	1.0	1.0	1.0
76	1.0	1.0	1.0	1.0	1.0
77	1.0	1.0	1.0	1.0	1.0
78	1.0	1.0	1.0	1.0	1.0
79	1.0	1.0	1.0	1.0	1.0
80	1.0	1.0	1.0	1.0	1.0
81	1.0	1.0	1.0	1.0	1.0
82	1.0	1.0	1.0	1.0	1.0
83	1.0	1.0	1.0	1.0	1.0
84	1.0	1.0	1.0	1.0	1.0
85	1.0	1.0	1.0	1.0	1.0
86	1.0	1.0	1.0	1.0	1.0
87	1.0	1.0	1.0	1.0	1.0
88	1.0	1.0	1.0	1.0	1.0
89	1.0	1.0	1.0	1.0	1.0
90	1.0	1.0	1.0	1.0	1.0
91	1.0	1.0	1.0	1.0	1.0
92	1.0	1.0	1.0	1.0	1.0
93	1.0	1.0	1.0	1.0	1.0
94	1.0	1.0	1.0	1.0	1.0
95	1.0	1.0	1.0	1.0	1.0
96	1.0	1.0	1.0	1.0	1.0
97	1.0	1.0	1.0	1.0	1.0
98	1.0	1.0	1.0	1.0	1.0
99	1.0	1.0	1.0	1.0	1.0
100	1.0	1.0	1.0	1.0	1.0

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